

Application No. 10/636,105
Filed: August 7, 2003
TC Art Unit: 3729
Confirmation No.: 9143

REMARKS

Claims 1, 5, and 19 are currently amended. Claims 2, 15, 16, 18 and 28-30 are cancelled without prejudice. Claims 3-4, 6-14, 17 and 20-27 remain as originally presented. New claims 31-35 have been added. Claims 1, 3-14, 17, 19-27 and 31-35 are pending.

Claim 1 has been amended to state the step of "applying a passivation layer to said surface of said device having said contacts extending therefrom", and further amended to state that the first underfill layer is applied "over said passivation layer" and is a "filled underfill" and that the second underfill layer is a "low-viscosity, lightly-filled underfill, ..., wherein the second low-viscosity, lightly-filled underfill is filled between 0-30% by weight and comprises a curing agent wherein the curing agent is at least one of anhydride, phenolic resin, amine, or a mixture thereof." Support for these amendments can be found in the specification at page 5, lines 24-29, at page 8, lines 7-8, at page 9, lines 20-27, at page 10, lines 9-10 and 17-19, and at page 11, lines 1-2 and 14-16, and further in the original claims numbered 2, 15, 18, 19, 29 and 30. Claim 5 has been amended to correct a typographical error. Claim 15 has been cancelled owing to inclusion of its limitation into amended claim 1. Claim 19 has been amended to state a filler load ranging "between" 0-10% by weight, which is supported in the specification at page 10, line 18.

Claims 31-33 are new claims, supported at page 9, lines 20-26. Claim 34 is a new claim for which support is found at page 9, line 30 to page 10, line 1, and at page 10, lines 17-19. Claim 35 is a new claim supported at page 9, lines 20-26.

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Information Disclosure Statement

The applicant notes Examiner's comment regarding a reference not considered owing to a mismatch of reference number and listed inventor. The error was caused by two reversed numerals. The reference intended for inclusion in the IDS filed on 11/14/03 is US Patent 6,475,828 issued to Hoang et al. on November 5, 2002.

A Supplemental IDS is attached hereto, which includes the corrected reference above and also includes additional art, namely three patents to Capote et al., newly discovered in the process of preparing this Response.

Claim Objection

The Examiner has objected to claim 16 as being a duplicate claim; therefore, applicant overcomes this objection per Examiner's direction by canceling claim 16.

Claim Rejections - Section 102

The Examiner has rejected claims 1-3, 5-20 and 28-30 as being anticipated by Wang et al. (US 6,168,972). Claim 1 is the sole independent method claim. Applicant has amended claim 1 to distinguish over Wang et al. and other known art, thus overcoming the rejection of claim 1 and thereby overcoming the Examiner's rejections as to all claims depending directly and indirectly therefrom, for the reasons that follow.

The Examiner states, "... Wang et al. do not mention of filler in the second underfill material, Examiner broadly

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considers the second underfill material of Wang et al. contains 0% by weight." Wang does not disclose filler being present at greater than 0% in a second underfill material, therefore Wang does not disclose a first filled underfill layer and a second low-viscosity lightly-filled underfill layer wherein the second low-viscosity lightly-filled underfill is filled between 0-30% by weight. The underlined language appears in claim 1 as amended. Amended claim 1 recites a method comprising the steps of "applying a layer of a first filled underfill ...; applying a layer of a second low-viscosity lightly-filled underfill to at least said conductive pads of said substrate surface, wherein the second low-viscosity lightly-filled underfill is filled between 0-30% by weight and comprises a curing agent wherein the curing agent is at least one of anhydride, phenolic resin, amine, or a mixture thereof;". Therefore, applicant's invention, as presently claimed in amended claim 1, comprises steps that are neither disclosed nor suggested by Wang et al., so that the rejection is overcome. Therefore, Examiner's rejection of original claims 3, 5-14, 17, 19 and 20, all of which depend directly or indirectly from claim 1, is similarly overcome.

The Examiner rejected claim 15 as anticipated by Wang et al., stating,

"Regarding claims 14-17, Wang et al disclose the step of coating at least said pads with a fluxing/curing agent or a polymer flux (350 see Col. 10, lines 9-11)."

Although Applicant has cancelled claim 15, Applicant has incorporated the language of original claim 15 into amended claim 1 to further distinguish over all prior art; therefore, Applicant respectfully presents counter-argument here to Examiner's position

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regarding the Wang et al. reference and "curing agent". Applicant respectfully submits that the Examiner has misread the reference Wang et al. in this regard. Wang et al., at Col. 10, lines 9-11 discloses,

"... a thin layer 350 of an ink containing tin, lead, copper, epoxy and an organic flux agent may [be] patterned on planarized solder balls 305 to facilitate solder reflow."

Wang does not disclose or suggest thin layer 350 is a curing agent. Nor does Wang anywhere disclose, discuss or suggest a curing agent. Wang discloses curing the epoxy layer only by changing temperature, wherein the temperature dependence can relate to catalyst in the epoxy (Wang at Col 6, lines 26-42 and Col. 9, lines 30-33). Wang teaches that the "degree to which cross-linking occurs depends upon the catalyst that is used and upon the thermal history of the epoxy (Col. 6, lines 28-30). However, a curing agent is a chemical compound that can be different from a catalyst:

"An agent which does not enter into the reaction is known as a catalytic hardener or catalyst. A reactive curing agent or hardener ... actually enters into the reaction. Cross-linking agents are distinguished from catalysts because they react with molecules and are coupled directly into the cured system as a structural member of the polymer." (emphasis supplied)
<http://composite.about.com/library/glossary/c/bldef-cl413.htm>

The Applicant discloses examples of curing agents (i.e., hardeners, or crosslinking agents) (see page 9, lines 20-26: "Hardeners (crosslinking agents) in the underfill ...") and Applicant specifically claims in amended claim 1 "... wherein the second low-viscosity lightly-filled underfill is filled between 0-30% by weight and comprises a curing agent wherein the curing

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agent is at least one of anhydride, phenolic resin, amine, or a mixture thereof."

Further, Wang teaches the purpose of the thin layer 350 is to "facilitate solder reflow" (Col. 10, line 11) and "to promote wetting and solder reflow between solder balls" (Col. 10, lines 12-14). Wang does not disclose or suggest any purpose of thin layer 350 that relates to the purpose of modifying the curing of the thin layer 350 or other combined layers.

Claim 19 is currently amended to become directly depending from claim 1 as currently amended and to state a method further comprising "a filler load ranging between 0 to 10% by weight", which filler load in the second underfill being greater than 0% is not disclosed by Wang et al., so that claim 19 as currently amended is similarly patentable over Wang et al.

Claim rejections - Section 103

The Examiner rejected claim 4 as unpatentable over Wang et al. in view of Mashimoto et al. (US 5,880,530). Claim 4 depends now from amended claim 1, which amended claim 1 is now patentable over Wang owing to the reasons given above. Therefore, Wang and Mashimoto together fail to teach all the limitations of claim 4 and amended claim 1, so that the rejection of claim 4 is thereby overcome.

The Examiner has rejected claims 21-27 as unpatentable over Wang et al. or in view of Farnworth (US 5,933,713). Claims 21-27 all depend from amended claim 1, which amended claim 1 is now patentable over Wang owing to the reasons given above. Therefore, Wang and Farnworth together fail to teach all the limitations of

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each of claims 21-27 and amended claim 1, so that the rejection of claims 21-27 is thereby overcome.


Summary

Claims 1, 3-14, 17, 19-27 and 31-35 are pending and have been put in condition for further examination and/or allowance. Claims 1, 5, and 19 are currently amended, with Examiner's rejections being overcome thereby. Claims 2, 15, 16, 18 and 28-30 are cancelled. Claims 3-4, 6-14, 17 and 20-27 remain as originally presented. New claims 31-35 have been presented. Applicant respectfully requests allowance of the pending claims.

The Examiner is requested to recalculate the filing fees based on the present amendment to the claims and is encouraged to telephone the undersigned attorney to discuss any matter that would expedite allowance of the present application.

Respectfully submitted,

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